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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/727,392	12/04/2003	Brian Vialpando	TI-35829	7423

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TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

AHMED, SHAMIM

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 12/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/727,392

Applicant(s)

VIALPANDO ET AL.

Examiner

Shamim Ahmed

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 10-21 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 10-13, 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zekeriya et al (6,607,962) in view of Chan (5,870,121) or Ohkawa (6,930,299).

Zekeriya et al disclose a process of forming a thin film resistor (TFR) contact, wherein the process comprises the steps of:

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- Forming a thin film resistor (TFR) material, wherein the TFR material comprises silicon chromium (SiCr), nickel chromium (NiCr), tantalum nitride (TaN) or titanium nitride (TiN) (col.5, lines 1-10);
- Forming a dielectric layer of silicon oxide over the TFR and etching the dielectric layer to form TFR via (114) (col.5, lines 29-55);
- Forming an etch-stop layer (116) over the TFR via and the TFR portion (106'), wherein the etch-stop layer comprises of an electrical conductor such as combination of Ti and TiN and which etch-stop structure resembles as the claimed electrical interface portion (col.5, lines 59-col.6, lines 4).

Zekeriya et al fail to teach the deposition of individual layers of Ti and TiN as the etch-stop or the barrier layer 116.

However, in a method of making resistors, Chan teaches deposition of two individual layers of Ti and TiN as resistive layer for better step coverage at the contact (col.3, lines 42-52 and col.4, lines 62-65).

OR, Ohkawa teaches prior to deposition of TiN barrier layer, Ti is deposited as an adhesion layer into a via hole (col.15, lines 4-8).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Chan or Ohkawa's teaching of depositing two individual layers into Zekeriya et al's teaching for better step coverage or for promoting the adhesion of TiN layer as taught by Chan and Ohkawa, respectively.

Modified Zekeriya et al remain silent regarding forming a second TFR via over a second end of the TFR.

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However, Zekeriya et al teach that the thin film resistors are employed in a many integrated circuits (col.1, lines 13-15) and the disclosure along with figures shows one TFR contact for structural simplicity (see figures).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to form a second via on a second end of the TFR structure in order to form more than one contact in the same manufacturing process for reducing process time.

As to claims 16-17, Zekeriya et al teach that forming a dielectric material layer (122) over the electrical interface portion; forming a contact via (124) to be filled with contact material such as tungsten (W) and then the contact material is etched back or polished back to remove the contact material (W) off the top surface of the dielectric layer and makes the contact plug (126) (col.6, lines 53-67).

5. Claims 14-15 and 19 –21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zekeriya et al (6,607,962) in view of Chan (5,870,121) or Ohkawa (6,930,299) as applied to claims 10-13,16-18 above, and further in view of Lammert (6,475,400).

Modified Zekeriya et al discusses above in the paragraph 4 but fail to teach sputter etching the TFR layer and the dielectric layer.

However, in a method of making TFR, Lammert teaches the TFR material layer is subjected to sputter etching to raise the resistance to a desired value, wherein the

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thickness of the resistor layer in the range of 50 to 50,000 angstroms (col.2, lines 49-66).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Lammert's teaching into Zekeriya et al's process for increasing the resistance value to a much tolerance as taught by Lammert et al.

It is noted that it would have been obvious to remove any remaining oxide as both the dielectric and the TFR material is exposed during the sputter etching and expected to have similar effect.

As to claims 15 and 20, Ohkawa teaches the thickness of the adhesion layer of Ti is in the range of 10-50 nm, which equates 100-500 angstroms and the thickness of the metal barrier layer is in the range of 10-100 nm, which equates 100 to 1,000 anstroms (col.15, lines 4-8).

As to claim 21, it is conventional and well known to ordinary skilled in the art to etch dielectric layer to form via or opening using diluted hydrofluoric acid.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shamim Ahmed
Primary Examiner
Art Unit 1765

SA
November 30, 2005